JC10 Rec'd PCT/PTO 1 9 FEB 2002

ORM PTO-1390 (Modified) REV 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE TRANSMITTAL LETTER TO THE UNITED STATES WEI0033 DESIGNATED/ELECTED OFFICE (DO/EO/US) U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR CONCERNING A FILING UNDER 35 U.S.C. 371 INTERNATIONAL APPLICATION NO. INTERNATIONAL FILING DATE PRIORITY DATE CLAIMED PCT/EP00/07989 16 August 2000 (16/08/2000) 21 August 1999 (21/08/1999) TITLE OF INVENTION METHOD AND DEVICE FOR PRODUCING COLOURED GLASSES APPLICANT(S) FOR DO/EO/US ROMER, Hildegard et al. Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information: 1. This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3.  $\times$ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include itens (5), (6), (9) and (24) indicated below. 4. The US has been elected by the expiration of 19 months from the priority date (Article 31). 5. A copy of the International Application as filed (35 U.S.C. 371 (c) (2)) a. 🛛 is attached hereto (required only if not communicated by the International Bureau). b. 🗆 has been communicated by the International Bureau. c.  $\square$ is not required, as the application was filed in the United States Receiving Office (RO/US). An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). a. 🛛 is attached hereto. 43. 43. b. 🗆 has been previously submitted under 35 U.S.C. 154(d)(4). Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3)) are attached hereto (required only if not communicated by the International Bureau). have been communicated by the International Bureau. c. 🗆 have not been made; however, the time limit for making such amendments has NOT expired. d. 🗆 have not been made and will not be made. An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)). An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)). 11. A copy of the International Preliminary Examination Report (PCT/IPEA/409). 12.  $\boxtimes$ A copy of the International Search Report (PCT/ISA/210). Items 13 to 20 below concern document(s) or information included: 13. An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 14. An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 15. A FIRST preliminary amendment. A SECOND or SUBSEQUENT preliminary amendment. 16. 17. A substitute specification. 18. A change of power of attorney and/or address letter. 19. A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825. 20. A second copy of the published international application under 35 U.S.C. 154(d)(4). 21. A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4). 22.  $\boxtimes$ Certificate of Mailing by Express Mail 23. Other items or information: Check No. 102883

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24. The following fees are submitt						CALCULATION	NS PTO USE ONLY
BASIC NATIONAL FEE ( 37 CFR 1.492							
☐ Neither international preliminary ex international search fee (37 CFR 1.4 and International Search Report not	45(a)(2))	paid to USPTO			\$1040.00		
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						Amount to be: refunded	\$
						charged	\$
a. A check in the amount of \$890.00 to cover the above fees is enclosed.  Blease charge my Deposit Account No. in the amount of to cover the above fees.  A duplicate copy of this sheet is enclosed.							
c. The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No A duplicate copy of this sheet is enclosed.							
d.  Fees are to be charged to a credit card. <b>WARNING:</b> Information on this form may become public. <b>Credit card information should not be included on this form.</b> Provide credit card information and authorization on PTO-2038.							
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.							
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John F. Hoffman	****		<b>l</b> (	OTC	1	7	
BAKER & DANIELS SIGNATURE							
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TX: (260) 424-8000 FAX: (260) 460-1700  26,280  REGISTRATION NUMBER							
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				DA	bruary 19, TE	2002	

# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re A	Application of	)
Hildeg	gard Römer et al.	) Group:
Serial	No.:	) ·
Filed:		) Examiner:
Title:	METHOD AND DEVICE FOR PRODUCING	,
	COLOURED GLASSES	ý

# PRELIMINARY AMENDMENT DELETING MULTIPLE DEPENDENT CLAIMS

Assistant Commissioner of Patents Washington, DC 20231

Sir:

Prior to calculating the filing fee, please enter the following amendments to the application.

### IN THE CLAIMS

In claim 5, line 1, delete "one of claims 3 or 4" and substitute therefor --claim 3--.

Please add the following new claim:

-6. An apparatus as claimed in claim 4, characterized in that from the melt vessel (1) there are at least two downstream strands (1.2, 1.3) with a skull device (3, 30) each and a stain supply device (6, 6.1) each.—

Respectfully submitted,

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Attorney for Applicant

JFH/pmp

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Date: February 19, 2002

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### An apparatus and method for producing colored glass

The glass production process starts with melting a so-called glass batch or refuse glass. The melting is usually performed in a melting end. It is walled of refractory material. Temperatures of up to 1650°C are reached.

The melting process is followed by a refining process. It is used to expulse physically or chemically bound gases from the melt. Particularly high temperatures of up to 3000°C are desirable in this process.

If one wishes to produce colored glass, the stain is added to the entire process already at an early stage, namely to the glass batch or the refuse glass during the melting process. This early addition of the stain is intended to ensure the most thorough mixing of the entire charge, i.e. of the stain on the one hand and the glass on the other hand, in order to avoid any waviness.

Melting ends usually have a relatively large volume. In the case of relatively small batches with differently colored glasses, it is necessary to perform a relatively frequent exchange of the content of the melting end. The exchange must be complete so as to avoid any undesirable deviations from the desired subsequent color. With respect to the aforementioned large volume of the melting end, the exchange will take a respectively long period of time. This means that the change from one color to another is linked to long interruption periods. A rapid response to customer wishes and new requirements concerning colorations is not possible.

Efforts have also been made to supply the stain only after the melting end. Homogenization is not always ensured in this case, however.

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The invention is based on the object of providing a method and an apparatus with which frequent changes in color are possible without producing long interruption periods while maintaining a favorable thorough mixing of stain and glass.

This object is achieved by the independent claims.

The inventors have recognized that the addition of stain is possible after the melting end in order to fulfill the said object if the melting end is provided downstream with a skull crucible which is heated with high frequency. Such a skull crucible is known from DE 33 16 546 C1 for example. It is provided with a wall which is formed by a ring of vertical metal pipes which are water-cooled. A slot-like intermediate space remains between two mutually adjacent metal pipes. The electromagnetic high-frequency field as produced by an oscillating circuit of a coil penetrates the cooled wall without or with low losses and is thus available in the hot electric conductive melt for producing eddy currents and thus Joule heat.

Strong convection currents occur in the skull crucible. The melt is very cold in narrow zones due to the water cooling at the walls of the skull crucible, whereas only a few millimeters away it is extremely hot by the absorption of electromagnetic energy.

These large temperature gradients, which within a distance of a few millimeters can reach up to 1500°C and more, lead to the occurrence of extremely fast convection rolls and thus to a very strong and effective thorough mixture of the melt zones. The thorough mixture not only causes a temperature and density offset, but especially also the desired offset of the chemical syntheses and thus a homogenization of the staining.

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Moreover, the viscosity of the melt in such a skull unit, in which no temperature limits are predetermined by corrosion of the wall material, can be reduced nearly at will, which further increases the convection and facilitates the thorough mixing. Optimal viscosities for an effective thorough mixture are in the range of less than 10<sup>2</sup> dPas, which requires temperatures over 1700°C in many HMP (high melting point) glass systems such as the alumosilicate glasses and glass ceramics for example. Such temperatures are not accessible with classical units due to the corrosion of the refractory materials. Such melting temperatures can be reached without any problems whatsoever in HF-heated skull crucibles.

In accordance with the invention, the stain is thus supplied to the melt after the melting end and before a high-frequency heated skull crucible. The stain can also be added in the skull crucible per se. The relevant aspect is that the stain is added at such a place in the process so that it is still grasped by the aforementioned convection roll and can thus be thoroughly mixed with the melt.

The skull crucible will generally be a refining crucible. The skull crucible has a vertical axis. It is also possible to add the stain before or in a skull groove, which means a groove which is designed according to the skull principle and accordingly comprises water-cooled pipes which form the wall of the groove and a high-frequency coil through which energy is coupled into the content of the groove.

**Embodiments:** 

In discontinuous crucible trials with melt volumes of 4 L to 8 L, the thorough mixture in a skull crucible was examined based on the example of alumosilicate glass-ceramics. A few grams of an oxidic stain such as cobalt oxide or vanadium oxide were added to the melts directly above the

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melt surface at melt temperatures of 1800°C to 2000°C. The energy supply was switched off after a maximum period of 5 minutes after the addition of the stain and the melt in the crucible was cooled. The crucible content was nearly completely homogeneously stained already after this short dwell period. Inhomogeneities were still observed merely in the zone of the crucible floor which does not take part in the convection in these discontinuous trials, which inhomogeneities could be eliminated in a continuous process or by higher melt temperatures (T > 2000°C).

In continuous processes it is possible to either add the stain in pure form to the melt or also a as glass which is highly doped with the stain. Especially in the case of a supply by way of a melting crucible which is disposed between the melting-in zone and the HF crucible, a glass is preferable to pure stain due to its meltability. Dosing is also usually less complicated in this case. In the case of supply via a rod, the stain can either also be introduced as a glass component of the rod or the stain can be compressed with a basic material.

The invention is now explained in closer detail by reference to the enclosed drawings, wherein the following is shown schematically:

Figs. 1 to 4 each show an installation for producing colored glasses.

The supply of the stain is made at different places.

Fig. 1 shows a melting end 1. It contains a glass melt with a melt level 1.1.

A groove 2 is adjacent to the floor zone of the melting end 1. It opens into the floor zone of a skull crucible 3. The skull crucible 3 is enclosed by the windings 3.1 of a high-frequency coil. One recognizes the schematically

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shown convention roll 3.2. Skull crucible 3 is used for refining the melt as produced in melting end 1.

A further groove 4 is provided further downstream. It conducts refined melt from the upper zone of the skull crucible 3 to a conditioning vessel 5. It comprises an outlet 5.1.

The relevant aspect is that the stain is added to the skull crucible, namely from a stain reservoir 6 whose outlet 6.1 opens into the skull crucible 3.

This arrangement is relatively simple. It has the disadvantage, however, that the convection in the skull crucible 3 can be used only within limits.

The embodiment according to fig. 2 is essentially the same as the one according to fig. 1. It differs however in the following: Stain reservoir 6 without outlet 6.1 is arranged in such a way that the stain 6.1 is injected into the connecting line 2. This is achieved in such a way that one sets the pressure in the stain reservoir 6 ("stain feeder") at a slightly higher level than the pressure in the connecting line 2. Depending on the density of the added stain concentrate it is necessary to vary the melt level in the stain feeder 6 with respect to the melt level 1.1 in the other system. If the density of the stain concentrate is higher than the density of the glass melt, the melt level in the stain feeder 6 must be chosen equal to or lower than that in the melting-in zone. If the density of the stain concentrate is lower than the density of the glass melt, the melt level of the concentrate in the stain feeder 6 must be chosen at a higher level than the melt level 1.1 in the melting end 1. The supply of the stain concentrate can be regulated either alone or by the hydrostatic pressure and the viscosity of the concentrate. It is also possible to provide the concentrate supply chamber in addition with an overpressure or underpressure control in order

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difference and viscosity.

to enable the regulation of the stain quantity independent of melt level

The crucible may be made of platinum for example.

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The principal arrangement of the unit according to fig. 3 is the same as that of figs. 1 and 2. The difference is, however, that the stain concentrate is supplied by means of a duct 6.1 which, in the manner of an electrode, immerses into the melt. The pass-through is thus air- or water-cooled in order to ensure leak-proofness. The cooling is reduced when required during the re-supply of stain concentrate.

Fig. 4 shows a further option of the stain feeder 6 as described herein. The melting end 1 is provided in this case with two outlets 1.2, 1.3. Two skull crucibles 3, 30 are provided schematically. Each skull crucible 3 or 30 is assigned a stain feeder 6 or 60, respectively. This option allows producing two different colored glasses simultaneously with one melting end. Instead of two outlets 1.2 and 1.3, it is possible to also use three or more outlets with assigned stain feeders and associated skull crucibles.

The arrows 4 and 40 indicate that the respective color glasses are supplied to further processing.

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### **CLAIMS**

- 1. A method for producing colored glasses;
- 1.1 with a melt being produced first of a glass batch or refuse glass;
  - 1.2 with the glass melt being further processed in at least one further vessel;
  - 1.3 with the melt being supplied to a skull device (skull crucible or skull groove) in the course of further processing;
  - 1.4 with the melt being supplied with a stain after the melting-in station, but before or in the skull device.
  - A method as claimed in claim 1, characterized by the following features:
  - 2.1 two or more glass melt strands are branched off from the melting-in station;
  - 2.2 at least one of the glass melt strands is provided with a skull device;
  - 2.3 a stain melt is supplied after the melting-in station, but before or in the respective skull device.
  - 3. An apparatus for producing colored glasses;
  - 3.1 with a melting vessel (1) for producing a melt from refuse glass or a glass batch;
  - 3.2 with a skull device (3) (skull crucible or skull groove) provided downstream of the melt vessel (1);
  - 3.3 with a stain supply device (6, 6.1);
  - 3.4 with the stain supply device (6, 6.1) being downstream of the melt vessel (1) and upstream of the skull device (3).
- 30 4. An apparatus for producing colored glasses;

- 4.1 with a melting vessel (1) for producing a melt from refuse glass or a glass batch;
- 4.2 with a skull device (3) (skull crucible or skull groove) provided downstream of the melt vessel (1);
- 5 4.3 with a stain supply device (6, 6.1);
  - 4.4 with the stain supply device (6, 6.1) being assigned to the skull device (3) in such a way that the stain is supplied directly to the melt contained in the skull device (3).
- 5. An apparatus as claimed in one of the claims 3 or 4, characterized in that from the melt vessel (1) there are at least two downstream strands (1.2, 1.3) with a skull device (3, 30) each and a stain supply device (6, 6.1) each.

### (12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

(19) Weltorganisation für geistiges Eigentum Internationales Büro



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(43) Internationales Veröffentlichungsdatum
1. März 2001 (01.03.2001)

**PCT** 

## (10) Internationale Veröffentlichungsnummer WO 01/14266 A1

- (51) Internationale Patentklassifikation<sup>7</sup>: 5/02, 5/185, 5/225, 5/44
- C03B 5/173,
- (21) Internationales Aktenzeichen:

PCT/EP00/07989

(22) Internationales Anmeldedatum:

16. August 2000 (16.08.2000)

(25) Einreichungssprache:

Deutsch

(26) Veröffentlichungssprache:

Deutsch

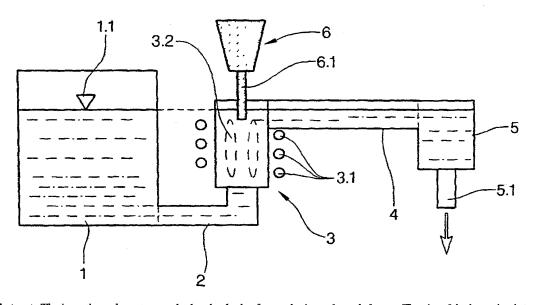
(30) Angaben zur Priorität:

199 39 785.6 21. August 1999 (21.08.1999) DE

- (71) Anmelder (für alle Bestimmungsstaaten mit Ausnahme von AU, GB, IE, IL, IN, JP, KE, KP, KR, NZ, SG, TZ, UG, US, Z4): SCHOTT GLAS [DE/DE]; Hattenbergstrasse 10, D-55122 Mainz (DE).
- (71) Anmelder (nur für AU, BB, BF, BJ, BZ, CF, CG, CI, CM, GA, GB, GD, GE, GH, GM, GN, GW, IE, IL, IN, KE, KG, KP, KR, KZ, LC, LK, LR, LS, MG, ML, MN, MR, MW, MZ, NE, NZ, SD, SG, SL, SN, SZ, TD, TG, TT, TZ, UG, VN, ZA, ZW): CARL-ZEISS-STIFTUNG trading as SCHOTT GLAS [DE/DE]; Hattenbergstrasse 10, D-55122 Mainz (DE).
- (71) Anmelder (nur für BB, BF, BJ, BZ, CF, CG, CI, CM, GA, GD, GE, GH, GM, GN, GW, JP, KE, KG, KZ, LC, LK, LR, LS, MG, ML, MN, MR, MW, MZ, NE, SD, SL, SN, SZ, TD, TG, TT, TZ, UG, VN, ZW): CARL-ZEISS-STIFTUNG [DE/DE]; D-89518 Heidenheim (DE).
- (72) Erfinder; und
- (75) Erfinder/Anmelder (nur für US): RÖMER, Hildegard [DE/DE]; Heidegasse 9, D-61184 Karben (DE). KIEFER, Werner [DE/DE]; Jupiterweg 19, D-55123 Mainz (DE).

[Fortsetzung auf der nächsten Seite]

- (54) Title: METHOD AND DEVICE FOR PRODUCING COLOURED GLASSES
- (54) Bezeichnung: VERFAHREN UND VORRICHTUNG ZUM HERSTELLEN VON FARBIGEN GLÄSERN



(57) Abstract: The invention relates to a method and a device for producing coloured glasses. The aim of the invention is to obtain a particularly intimate mixture and to enable a quick change of the melt at the same time. To this end, the following procedure steps are applied: a melt made of a compound or fragments of glass is produced, the glass melt is further processed in at least one additional vessel, the melt is supplied to a skull device (3) (skull pot or skull channel) during subsequent processing, a dye is supplied (6, 6.1) to the melt after the melt was in the melting station (1) but before the melt enters the skull device (3) or while said melt is in the skull device.

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Fig.1

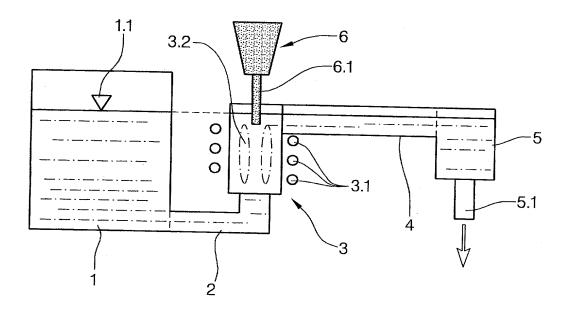


Fig.2

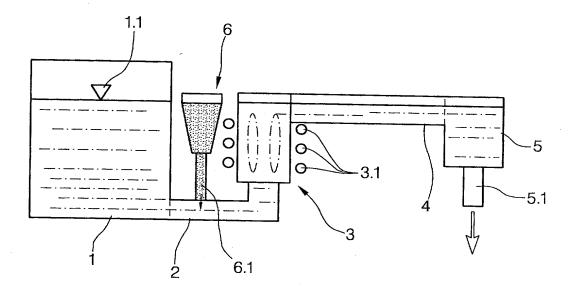
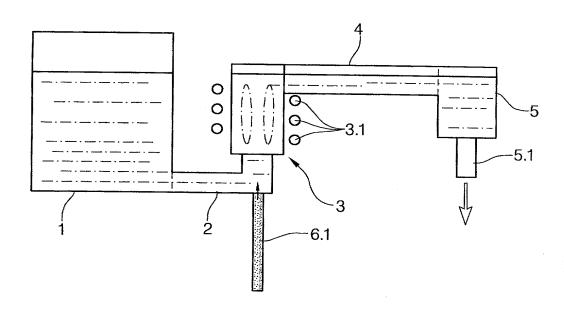
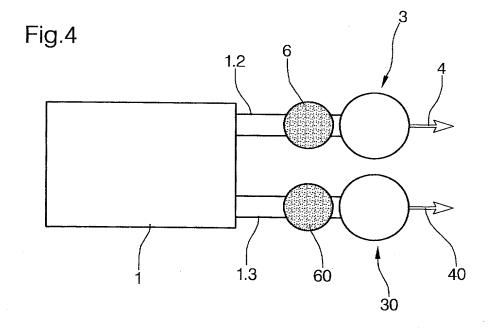


Fig.3





TO/SB/103 (8-96)

Approved for use through 9/30/98. OMB 0651-0032 Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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## Declaration and Power of Attorney for Patent Application Erklärung für Patentanmeldungen mit Vollmacht

### German Language Declaration

Als	nachstehend	benannter	Erfinder	erkläre	ich	hiermit	an	Eides
Stat	t:							

As a below named inventor, I hereby declare that:

Wohnsitz, meine Postanschrift und meine Staatsangehörigkeit den im nachstehenden nach meinem Namen aufgeführten Angaben entsprechen, daß ich nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (fails nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent für die Erfindung mit folgendem Titel beantragt wird:

My residence, post office address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

METHOD AND DEVICE FOR PRODUCING COLOURED GLASSES

deren Beschreibung hier beigefügt ist, es sei denn (in diesem Falle Zutreffendes bitte ankreuzen), diese Erfindung

the specification of which is attached hereto unless the following box is checked:

a wurde angemeldet am unter der US-Anmeldenummer oder unter Internationalen Anmeldenummer im Rahmen des Vertrags über die Zusammenarbeit auf dem Gebiet des Patentwesens (PCT) und am abgeändert (falls zutreffend).

was filed on August 16, 2000 as United States Application Number or PCT International Application Number PCT/EP00/07989 and was amended on \_ (if applicable).

Ich bestätige hiermit, daß ich den Inhalt der oben angegebenen Patentanmeldung, einschließlich der Ansprüche, die eventuell durch einen oben erwähnten Zusatzantrag abgeändert wurde, durchgesehen und verstanden habe.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

Pflicht zur Offenbarung jeglicher Informationen an, die zur Prüfung der Patentfähigkeit in Einklang mit Titel 37, Code of Federal Regulations, § 1.56 von Belang sind.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

#### [Page 1 of 3]

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Ich beanspruche hiermit ausländische Prioritätsvorteile gemäß Title 35, US-Code, § 119 (a)-(d), bzw. § 365(b) aller unten aufgeführten Auslandsammeldungen für Patente oder Erfinderurkunden, oder §365(a) aller PCT internationalen Anmeldungen, welche wenigstens ein Land ausser den Vereinigten Staaten von Amerika benennen, und habe nachstehend durch ankreuzen sämtliche Auslands- anmeldungen für Patente bzw. Erfinderurkunden oder PCT internationale Anmeldungen angegeben, deren Anmeldeting dem der Anmeldung, für welche Priorität beansprucht wird, vorangeht.

I hereby claim foreign priority under Title 35, United States Code, §119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Applications Frühere ausländische Ammeldungen)		<del>"</del>	Priority Not Claimed Prioritat night beausprucht
199 39 785.6 (Country) (Land)	ermany	21 August 1999 Day/Month/Year Filed) (Tag/Monat/Jahr der Anmeldung)	٥
(Number) (Country) (Nummer) (Land)		(Day/Month/Year Filed) (Tag/Monat/Jahr der Anmeldung)	٥
ch beauspruche hiermit Prioritätsvorte i 119(e) aller US-Kilfsanmeldungen w		I hereby claim the benefit under Titl § 119(e) of any United States provis	
(Application No.) (Filing Da (Algenzeichen) (Anmeldet:			
(Application No.) (Filing Da (Aktenzeichen) (Anmeldet		) I hereby claim the benefit under Tit	de 35, United States Code, § 120 of

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(Application No.) (Aktenzeichen)	(Filing Date) (Anmeldetag)			
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